# Coupling into the photonic crystal waveguides in the slow light regime

Y.A.Vlasov and S.J.McNab
IBM Watson Research Center, Yorktown Heights, NY 10598.

Coupling of external light signals into photonic crystal waveguides becomes increasingly inefficient as the group velocity slows owing to an increasingly large mode impedance mismatch. We have systematically studied the efficiency of coupling from a strip waveguide into a photonic crystal waveguide for samples with different truncations of the photonic lattice at the coupling interface. Observation of fast oscillations near the transmission cutoff allows the spectral dependencies of the group index, coupling efficiency, and reflectivity at the coupling interface to be extracted independently. It is found that the coupling efficiency is significantly improved up to group indices of 100 for a truncation of the lattice that increases the local density of surface states, which are tuned in resonance with the slow light mode in the photonic crystal waveguide. Band structure calculations indicate that this resonant tunneling is responsible for increased coupling efficiency.

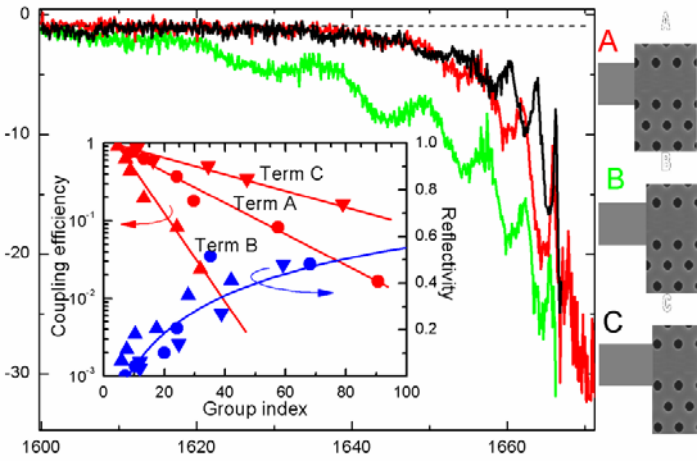


**Fig.1** Transmission spectra of PhC waveguides with different termination of the coupling interface. Inset: coupling efficiency and reflectivity dependencies on the group index.